AdvanTex™ Treatment System

Provisional Approval and Testing Protocol

September 27, 2001

I. System Description

The AdvanTex™ Treatment System consists of the following listed key components. This Provisional Protocol is based on the specific components listed. Equivalent components may be used after receiving written approval from the Division of Onsite Sewage and Water Services (the Division). Unless otherwise stated, the components of the AdvanTex™ Treatment System shall comply with the intent, objectives and requirements of the *Sewage Handling and Disposal Regulations* (the *Regulations*).

A. Building Sewer. The building sewer used in conjunction with an AdvanTex™ Treatment System shall comply with Part IV, Article 2 of the *Regulations*.

B. Processing Tank. The AdvanTex™ Processing Tank (nominal 1,500-gallon minimum liquid capacity) combines the benefits and functionality of a septic tank with a pump tank. The capacity of the Processing Tank's first compartment is 1,000 gallons. The second compartment of the Processing Tank houses the AdvanTex™ Recirculation Pumping System. The capacity of the second compartment is 500 gallons liquid capacity.

   Homes up to four bedrooms require a minimum two-compartment, 1500-gallon tank with a minimum 12-square-inch flow-through port(s) at 60-70% of the lowest normal liquid level. The first compartment should have a minimum 1,000-gallon volume. (Two 1,000-gallon single-compartment tanks in series are an acceptable alternative.)

C. Secondary Treatment System. The AdvanTex™ modules are made of pre-assembled, UV-protected fiberglass reinforced plastic (FRP) material. The treatment unit contains an effluent distribution system and proprietary textile polyester-based media followed by a filtrate conveyance pipe (under drain) to a flow-splitting valve discharge and recirculation tank. The AX10 dimensions are approximately 2.5 feet wide by four feet long by 2.5 feet deep. The AX20 dimensions are approximately 7.5 feet long by three feet wide by 2.5 feet deep. The modules are fitted with UV-protected, removable FRP composite lids.

D. Pretreatment Devices. Single or multiple pretreatment devices may be used in accordance with Table 1 to treat various sized houses. When more than one unit is used, each unit is installed at the same elevation with effluent flow uniformly split between both modules. Elevation tolerances are dictated by the slope required from the bottom of the pods to the recirculating splitter

valve; this is essential so that one pod does not flood the other. The system designer shall specify the elevations required for all relevant system components relative to a site-specific field established benchmark.

Number of Bedrooms	Minimum Single Processing Tank Size (gals.)	Processing Tank split into separate Septic and Pump Tank	Number of AX Units
2	1500	2 x 1000 gallon tanks	1 AX20
3	1500	2 x 1000 gallon tanks	1 AX20
4	1500	2 x 1000 gallon tanks	1 AX20
5	2000	2 x 1000 gallon tanks	1 AX20 + AX10
6	3000	2 x 1500 gallon tanks	2 AX20

Table 1

Septic tank effluent is dosed (recirculated) from a Biotube Pump Vault to the treatment module where treatment occurs by a combination of physical, biological and chemical processes. The average treatment capability of the AdvanTex™ Treatment System is reported in Table 2 and, in part, formed the basis for this approval.

Parameter	Percent Reduction
BOD_5(mg/l)	>96%
TSS (mg/l)	>95%
NH3-N (mg/l)	>90%
Tot. coliform	>99.9%
E. coli	>99.9%

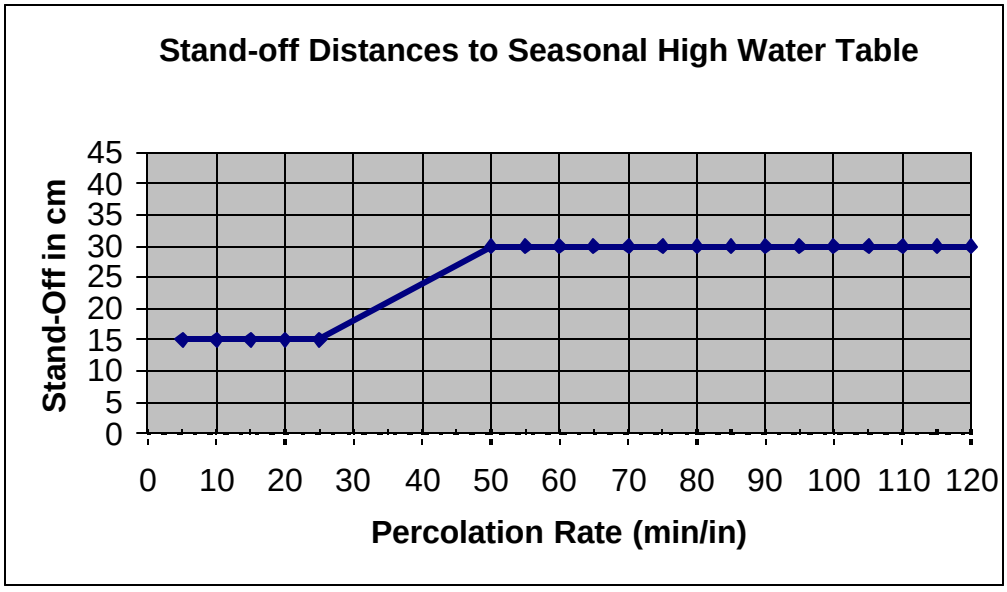
Table 2

E. Conveyance System. All effluent conveyance components designed to move effluent from the AdvanTex™ Treatment System to an absorption area shall comply with the requirements of 12 VAC 5-610-880 of the *Regulations*.

[**Note:** Conveyance system refers to the actual conveyance system and not to the proprietary pumps and pump chamber portions of the AdvanTex™ Treatment System.]

F. Absorption Area. When the criteria found in the *Regulations* and Figure 1 (of this document) are met, the absorption field shall be designed in accordance with Table 4 below for all systems covered by this policy.

Figure 1



II. Scope of Waiver

This Provisional Approval is granted for facilities generating residential strength wastewater that have a design flow not exceeding 1,000 gallons per day. Larger flows may be permitted but shall be reviewed individually to assure compliance with the requirements of §441 of the *Regulations*. Influent waste strength shall not exceed domestic septic tank quality effluent, and be in accordance with the following parameters:

Influent Characteristics, Orenco AdvanTex™ Treatment System[1]			
	Average, mg/L	Weekly Peak, mg/L	Rarely Exceeds, mg/L
Biochemical Oxygen Demand (BOD)	150	200	300
Total Suspended Solids (TSS)	40	60	150
Total Kjeldahl Nitrogen (TKN)	65	75	150
Grease plus Oil	20	25	25

Table 3

[1] These influent numbers are representative of septic tank effluent pumped through a Biotube® Pump Vault out of the AdvanTex™ Treatment System processing tank.

III. Siting Criteria

The AdvanTex™ Treatment System may be used to provide wastewater treatment at any site that meets one of the following classifications:

1. Any site that does not comply with the minimum stand-off to rock and/or water table requirements contained in the *Regulations* but does comply with the requirements established in this policy.

2. Any site that fully complies with the criteria contained in the *Regulations*, including, but not limited to, absorption area sizing percolation rate, landscape position, stand-off distances, and set-back distances. This includes sites that comply with the *Regulations,* whether or not secondary effluent is required.

3. Any repair permit that complies with 12 VAC 5-610-280 C.2, where the AdvanTex™ Treatment System is used to enhance wastewater treatment and potentially enhance wastewater disposal.

IV. Design Criteria

All portions of the system shall be designed to provide wastewater treatment and disposal, which is equal or superior to that obtained with a conventional gravity drainfield system. In general, the system must provide primary treatment, secondary wastewater treatment, and effluent distribution and application to soils capable of providing sufficient additional secondary treatment to render the wastewater harmless to humans and the environment. Specific deviations from the design practices contained in the *Regulations* are described below.

A. Field Design

The absorption area required may be achieved by use of the bed area, use of gravel absorption trenches, or a combination of both pad area and trenches, provided:

1. The minimum standoff to water table, or other limiting factor, is achieved over the entire absorption area. This assures that sufficient suitable soil, as may be required, exists between the soil and the limiting factor to provide additional treatment.

2. All pads and trenches shall be installed on contour.

3. All pad areas (bed type design) shall be designed such that in all instances the bottom pad area shall be level while maintaining separation distances to all soil limiting factors. No portion of the pad bottom area may be installed on fill material. On sites where these conditions cannot be met, another absorption area configuration shall be used.

4. The system shall be designed to provide nominally equal flow throughout all portions of the absorption area. Distribution of effluent by gravity or pressure dosing (before or after the treatment system) is acceptable.

5. The maximum bed area shall be 400 square feet.

B. Area Requirements and Calculations

AdvanTex™ Treatment Systems shall be sized in accordance with Table 4 of this document. Systems may be configured where the absorption area consists of a "pad" (absorption bed) with conveyance to the pad by pressure or gravity distribution. The absorption area may consist of gravity or pressurized gravel trenches or shallow graveless trenches as described in the *Regulations*. Low pressure or drip dispersal may be used in pressurized distribution applications. A combination of pad and trenches may also be used.

1. The size of the pad, if utilized, is generally rectangular in shape with variable dimensions established to meet the site-specific conditions encountered. The pad area shall be placed on contour and the total area shall be based on 150 gallons per 200 square feet of pad area. For the purpose of dividing flow between pads and trenches (where both are used in a single system) the following methodology is used. Flow to the pad is determined by the formula Q = Plr*A where Q equals the flow to the pad in gallons, Plr equals the pad loading rate in gallons per square foot (found in Table 4) and A is the area of the pad in square feet.

2. When a pad is not utilized (typically but not necessarily Class III and IV soils) or when the flow to the pad (Q) as determined above is less than the total daily flow to the system, absorption trenches are required. Trenches utilized may be 1.5', 2.0', or 3.0' in width. The number of square feet needed is determined by establishing the flow to the trenches in gallons per day and dividing by the loading rate in Table 4.

Hydraulic Loading Rates for Drainfields Receiving AdvanTexÔ Treatment Systems Effluent				
Percolation Rate (Minutes/Inch)	**Gallons Per Day Per Square Foot**			
		Trenches		
	Beds	1.5 wide	2.0 wide	3.0 wide
20 or less	**1.66**	**2.78**	**2.50**	**2.22**
25	**1.33**	**2.22**	**2.00**	**1.78**
30	**1.11**	**1.85**	**1.66**	**1.48**
35	**0.95**	**1.59**	**1.43**	**1.27**
40	**0.83**	**1.39**	**1.25**	**1.11**
45	**0.74**	**1.23**	**1.11**	**0.99**
50	**0.67**	**1.11**	**1.00**	**0.89**
55	**0.61**	**1.01**	**0.91**	**0.81**
60	**0.55**	**0.93**	**0.83**	**0.74**
65	**0.51**	**0.85**	**0.77**	**0.68**
70	**0.48**	**0.80**	**0.72**	**0.64**
75	**0.44**	**0.74**	**0.67**	**0.59**
80	**0.42**	**0.69**	**0.63**	**0.56**
85	**0.39**	**0.65**	**0.59**	**0.52**
90	**0.37**	**0.62**	**0.56**	**0.49**
95	**0.35**	**0.58**	**0.53**	**0.47**
100	**0.33**	**0.56**	**0.50**	**0.44**
105	**0.32**	**0.53**	**0.48**	**0.42**
110	**0.30**	**0.51**	**0.45**	**0.40**
115	**0.29**	**0.48**	**0.43**	**0.39**
120	**0.28**	**0.46**	**0.42**	**0.37**

Table 4

3. The minimum area for any AdvanTex™ Treatment System shall be 320 square feet.

4. Conditional use permits based on limited occupancy (or other specified criteria) shall be permitted in accordance with the criteria contained in the *Regulations*.

5. No additional area reduction shall be permitted for the use of water saving fixtures.

C. Distribution

When the absorption area is located contiguous to the AdvanTex™ Treatment System, Orenco's design for gravity flow through adjacent gravel trenches may be used, provided:

1. The bottom of all portions of the absorption area shall be installed at a single elevation (+/- 2") and on contour (requires a flat or essentially flat site), or

2. All absorption trenches shall be installed on contour. On sloping sites, parallel distribution (utilizing a distribution box or pressure distribution) shall be employed when laterals are installed on more than one elevation.

3. Distribution to the absorption area occurs after the recirculating splitter valve. It may be accomplished by gravity flow to a distribution box or under positive pressure to a manifold. In either event, effluent will be applied proportionally to the absorption area as described in Part IV A (Field Design) above. Gravity flow from the recirculating splitter valve to a pump basin for conveyance to a distribution box or manifold is also acceptable provided effluent will be applied proportionally to the absorption area as described in Part IV A (Field Design) above.

D. Depth

The absorption system (i.e., the bottom of the gravel pad and/or trenches that comprise the absorption area) may be installed at grade. On sloping sites this shall be measured on the downhill side of the installation (i.e., no fill material may be placed below the absorption system). Cover material shall be provided from the top edge of the AdvanTex™ Treatment System horizontally in all directions to existing grade and shall cover the top and side of the pad area, which may be exposed during construction. The minimum cover over the pad area, and any trenches, shall not be less than four inches.

E. Slope

The maximum allowable slope for the absorption area shall be 50%.

F. Pump Design

The AdvanTex™ Treatment System contains a pump and pump chamber as an integral part of the system to dose the textile media. The design and installation of this pump is proprietary and does not need to comply the requirements of the *Regulations* provided the following conditions are met:

1. The pump, pump chamber, and appurtenances do not create any health hazards, safety problems or nuisances.

2. The average life of the pump and components is not less than seven years.

V. Installation

A. Installers shall be trained by Orenco Systems Inc., and/or a Certified AdvanTex™ Treatment System Dealer, and be certified as having passed their minimum training qualifications prior to installing any systems in Virginia.

B. The manufacturers recommendations shall be followed for system startup.

C. All mechanical components, pumps, pump cycling, filters, systems must be demonstrated to be fully operational in accordance with their design.

VI. Operation

All system owners shall be provided with written and oral instruction on the proper operation and maintenance of the AdvanTex™ Treatment System. Updates, revisions and other changes to this section are the responsibility of Orenco Systems, Inc. Copies of changes shall be submitted to the Virginia Department of Health (VDH) on an informational basis. Nothing in this approval is intended to prevent or restrict the development of instructional materials for public use. No prior approval of such literature is required provided the literature contains no endorsements, approvals, or suggestions that VDH in any manner promotes the use of one system above any other.

VII. Testing and Evaluation Procedures

A specific Sampling Protocol for field-testing, sampling, and evaluation will be developed and conducted under the supervision of the Division of Onsite Sewage and Water Services (the Division), in conjunction with Orenco Systems, Inc. The conducting of all sampling and the submission of all reports shall be done by, or under the supervision of, a qualified individual mutually agreed upon in Virginia, to be designated jointly by the Division and Orenco Systems Inc. If a local or district health department wishes to monitor a particular system for which they have issued a permit under this protocol, the manager or supervisor from that office shall contact Division staff, who will recommend to Orenco Systems, Inc., that the system be included in the sampling program.

The responsibility for assuring that sampling occurs rests exclusively with Orenco Systems, Inc. Effluent samples shall be collected at a depth of 12" below the bottom of the absorption area. For the purposes of evaluating test results, samples will be collected to assess performance at a point below an estimated 12" of unsaturated soil. [Note: As initially permitted, systems installed in soils with a percolation rate of less than 50 minutes per inch, and in accordance with this protocol, will not always be installed at least 12 inches above a seasonally saturated horizon.]

Each system selected by the Division and Orenco for sampling shall have two suction lysimeters installed for the purpose of sampling effluent. At least one of these suction

lysimeters shall be located beneath the footprint of the AdvanTex™ Treatment System soil absorption area. One lysimeter may be located beneath an absorption field trench provided it is located within the first ten feet of the trench. Because of the advantages of installing monitoring devices at the time of system installation, as compared with retrofitting of monitoring devices to systems already installed, the Division or Orenco Systems, Inc., may contact a local health department for assistance in the scheduling of installation of systems selected for sampling. The suction lysimeters must be designed to preclude the entrance of untreated effluent and the final design shall be agreed to between VDH and Orenco within six months of installing the first system and prior to installation of any the lysimeters.

Standards

Fecal Coliforms: The average of samples collected from unsaturated soil horizons shall have a geometric mean of less than 10 cfu/100mls and have no single sample in excess of 200 cfu/100mls. Sample results obtained during the first six months of operation may be discarded from the performance evaluation at the sole discretion of VDH, when there appears to be due cause.

Nitrate-nitrogen: No performance standard is established; however, results may be used to demonstrate nitrate-nitrogen reduction and used where this is necessary.

Chlorides: An increase in chloride concentrations must be observed to confirm that treated effluent is being collected.

Five Day Biochemical Oxygen Demand (BOD_5): First compartment processing tank samples will be taken over the sampling period to verify that a typical strength, residential waste is being treated[1]. Effluent from the AdvanTex™ Treatment System shall be tested monthly for one year and quarterly thereafter to demonstrate treatment effectiveness. Results may be used to qualify the AdvanTex™ Treatment System for use under the *Discharge Regulation*s and to establish/verify treatment performance of the AX unit under insitu residential use.

Surfacing and ponding: Any system that shows surfacing of effluent shall be considered a failure. An evaluation shall be made of the system and the cause of failure and corrective action shall be taken. Ponding depth within the absorption area shall be monitored on a monthly basis in each system. Two monitoring ports shall be installed exclusively for this purpose and ponding depths reported not less than monthly. Ponding depths shall be compared with systems installed in conventional systems to attempt to determine the life expectancy of the system with the higher application rate of more highly treated wastewater.

[1] Because the first compartment processing tank is a recirculation tank (i.e., treated and untreated effluent is mixed in this tank) actual influent strength can only be inferred.

VIII. Operation and Monitoring

For the first five years of use after this provisional approval is granted, Orenco Systems, Inc., shall maintain a log of all systems installed. This log shall include the following minimum information: System location (by tax map or owner's name and county) soil conditions where the system was installed, and all associated physical, biological and chemical data if the system is one being monitored. This log shall be reported to VDH on a quarterly basis and shall be provided by the 15th of the month following the end of the quarter. The log shall be available to VDH within 5 business days upon request.

IX. Responsibilities and Permitting Procedures

A. This approval has been granted specifically for the process described in the application made by Orenco Systems Inc., for the AdvanTex™ Treatment System. Any changes to the components used in this process must be reviewed and approved by VDH on a case-by-case basis prior to use.

B. No contractor may install an AdvanTex™ Treatment System unless they are first certified by Orenco Systems Inc., and/or an Orenco Systems Inc., certified AdvanTex™ Dealer as meeting their minimum competency standards for contractors.

C. The AdvanTex™ Treatment System is a provisionally approved system; however for the purposes of permitting, it shall be handled in the same manner as a Type II system.

D. Permitting shall be done by the local health department based on their satisfactory site evaluation and review of plans and specifications prepared in accordance with the manufacturer's specifications and all applicable state regulations and policies and any relevant local ordinances.

E. Construction permits (i.e., not operation permits) normally shall be valid for a period of 18 months; however, no construction permit shall be valid beyond the completion date of the experiment. VDH shall establish the completion date of the experiment by determining when sampling on the 24 systems being monitored under this protocol will be completed. Upon successful completion of the provisional protocol, unused construction permits will convert to conventional construction permits and the life of the permit extended to 18 months from the date of issuance. Such conversion shall be done at no cost to the permit holder. In the event that the system fails the provisional protocol, unused permits will not be renewed. Permits shall note the provisional nature of the system and that they cannot be converted to a certification letter. Upon successful completion of the provisional protocol, the holder of a valid provisional permit may convert the same to either a conventional construction permit or a certification letter. In the event that the provisional system fails to meet the protocol, VDH is not obligated to reissue either a construction permit or a certification letter.

F. Orenco Systems, Inc., shall be responsible for providing up to six classes (up to 50 students each) during the first six months after this approval is granted and two classes annually thereafter. The training shall include a manual covering proper siting, sizing, construction, and installation and inspection processes for the AdvanTex™ Treatment System. All training materials, the course syllabus and training locations shall be reviewed and approved by the Division prior to training occurring.

G. Should the AdvanTex™ Treatment System fail to perform to the satisfaction of VDH, VDH may rescind or modify this Provisional Protocol. Prior to taking such action, VDH shall notify Orenco Systems, Inc., of the nature of the problem and of the action it intends to take.